Book: Marine Bioacoustic Signal Processing and Analysis

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LONG-TERM GOALS

Acoustic signal processing has long been the domain of electrical and mechanical engineers, physicists, and mathematicians. However, more and more biologists and psychologists are starting to use advanced signal processing techniques and analyses, especially with the influx of the many signal processing programs now available. What is lacking for many of these new users is an understanding of the theoretical underpinnings of different techniques. This has happened because the learning curve can be rather steep, especially for those in the biological and psychological sciences, and the theoretical constructs are often ignored or deemed too difficult to comprehend. This also applies to many students and beginning researchers with a physical science background, since various ideas and methodologies are scattered across different texts and manuscripts.

The goal of this project is to write a book on animal bioacoustics that brings together ideas, concepts and methods that are often found in diverse texts and manuscripts. We will approach basic principles from the perspective of processing and analyzing acoustic signals emitted by animals. The book will be aimed at advanced undergraduates and beginning graduate students – people with some background in sound analysis who come from a background in either an animal communication or signal processing. Our goal will be to make a practical guide by which people can understand and use the tools we have, rather than an theoretical exposition of the frontiers of our field. Such a book that is written with animal bioacousticians in mind is strongly needed in order for the field to grow in a good way. By making bioacoustic signal processing techniques available to a wider audience, we aim to advance the understanding and utility of marine bioacoustics.

OBJECTIVES

The objective of this effort is to write and publish a book, *Marine Bioacoustic Signal Processing and Analysis*.

APPROACH

This book will be co-authored by Dr. David Mellinger from Oregon State University and myself. We will meet 2-3 times per year to review any work done to date and to plan the writing of succeeding chapters. In between these meetings, we will write chapters and edit each others' work via email.

We plan to publish the book with the cooperation and assistance of the Acoustical Society of America. Au is on the editorial board of the ASA-Springer Verlag cooperative effort to have relevant book on acoustic written and published. The ASA has published a number of books with Springer-Verlag.

WORK COMPLETED

We received notice that this project had been funded around the end of June 2007, so David and I have not had a lot of time to work on it yet. We had our first planning meeting in Corvallis, OR on 27 Aug 2007, at which we discussed and slightly revised the table of contents for the book, planned who will write each of the first four chapters, discussed the writing style, discussed the possibility of material outside the book (e.g., software, either on a CD-ROM or a web site), and agreed to meet again at the end of November to review what we've written and where to go next.

RESULTS

We decided to revise our table of contents slightly: make a separate chapter on the Fourier Transform and its applications, including the Discrete Fourier Transform, the Fast Fourier Transform, and spectrograms. Other time/frequency representations will be remain a separate chapter. We may also move the chapter on filtering to a different place in the order of chapters.

I will write the Introduction and the chapter on Fourier transform and we both will colloborate on time-frequency transforms. As alluded to above, I plan to finish the first drafts of these by the end of November 2007, when Mellinger and I will meet again.

IMPACT/APPLICATIONS

None

RELATED PROJECTS

None